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ABSTRACT

This is an experimental course of study designed to introduce the junior high school student to the field of chemistry through his knowledge and understanding of chemical reactions which take place in his world. The everday experiences which the student encounters show the classification, phases, and changes of matter. No prerequisite courses are suggested for this study of the World of Matter. Several state-adopted texts are listed, including those of physical science, general science, chemistry and the nature of matter. Six performance objectives are suggested based on a course outline divided into six major topics: (1) Matter; (2) States of Matter; (3) Changes in Matter; (4) Classification of Matter; (5) Observation of Chemical Reactions; and (6) Practical Use of Chemistry. Student-involved activities include experiments (drawn from several different sources), and viewing of films. A list of 16 reference books is included. A master sheet organizes the laboratory experiments, the student texts, the supplementary references and films and/or transparencies to be used with each of the major concepts to be presented. (Author/EB)

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AUTHORIZED COURSE OF INSTRUCTION FOR THE QUINMESTER PROGRAM

THE WORLD OF MATTER

5311.07
5312.07
5313.07

(Experimental)

DADE COUNTY PUBLIC SCHOOLS

DIVISION OF INSTRUCTION • 1971

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Written by Ronald J. Matzuga
for the
DIVISION OF INSTRUCTION
Dade County Public Schools
Miami, Florida
1972

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THE WORLD OF MATTER

COURSE DESCRIPTION

This course is designed to introduce the student to the field of chemistry through his knowledge and understanding of common chemical reactions which take place in his world. These everyday experiences will show the classification, phases, and changes of matter.

ENROLLMENT GUIDELINES

None

STATE ADOPTED TEXTS

Abraham, Norman, et al. Interaction of Matter and Energy. Chicago: Rand McNally and Company, 1968.

Brandwein, Paul F., et al. Matter Its Forms and Changes. New York: Harcourt, Brace and World, Inc., 1968.

Choppin, Gregory R. and Jaffe, Bernard. Chemistry: Science of Matter, Energy, and Change. Morristown: Silver Burdett Company, 1965.

Greenstone, Arthur W., et al. Concepts in Chemistry. New York: Harcourt, Brace and World, Inc., 1966.

IPS Group of Educational Services Incorporated. Introductory Physical Science. New Jersey: Prentice-Hall, Inc., 1967.

Metcalfe, H. Clark, et al. Modern Chemistry. New York: Holt, Rinehart and Winston, Inc., 1968.

Oxenhorn, Joseph M. and Idelson, Michael N. Pathways in Science, Chemistry 1: The Materials of Nature. New York: Globe Book Company, Inc., 1968.

Tracey, George R., et al. Modern Physical Science. New York: Holt, Rinehart and Winston, Inc., 1970.

PERFORMANCE OBJECTIVES

1. The student will classify matter as organic or inorganic.

2. The student will identify materials as to their state (phase) of matter.

3. After performing several experiments, the student will classify the types of changes in matter.

4. Given a list of common substances, the student will identify each as an element, compound or a mixture.

5. Given a list of chemical reactions involving common materials, the student will identify the type of each reaction.

6. Given a practical situation, the student will explain the principle of chemistry involved.

COURSE OUTLINE

I. Matter

A. Organic

B. Inorganic

II. States (Phases) of Matter

A. Solid

B. Liquid

C. Gas

III. Changes in Matter

A. Physical

1. Evaporation
2. Distillation
3. Melting
4. Freezing

B. Chemical

IV. Classification of Matter

A. Elements

B. Compounds

C. Mixtures

V. Observation of Chemical Reactions

A. Decomposition

B. Synthesis

C. Replacement

VI. Practical Use of Chemistry

A. Combustion and Combustable Materials

B. Cleaning Agents and Solvents

C. Refrigeration

D. Oxidation (rusting)

E. Insecticides

F. Detergents and bleaches

G. Hard and soft water

EXPERIMENTS

Abraham, Norman, et al. Interaction of Matter and Energy. Chicago: Rand McNally and Company, 1968.

1. Calibrating a Thermometer (Inv. 34, p. 191)
2. Water and Ice (Inv. 35, p. 200)
3. Ice, Salt, Sugar, and Alcohol (Inv. 36, p. 201)
4. Behavior of Matter Under Condition of Low Temperature (Inv. 37, p. 203)

Brandwein, Paul F., et al. The World of Matter and Energy. New York: Harcourt, Brace and World, Inc., 1964.

5. Recognizing the Changes (p. 16)

Geffner, Saul L. and Lauren, Paul M. Experimental Chemistry. New York: Amsco School Publications, Inc., 1968.

6. Molecular Models of Some Organic Compounds (Exp. 47, p. 193)
7. Reactions of Functional Organic Groups (Exp. 48, p. 199)
8. Temperature and Change of State (Phase Change) (Exp. 5, p. 21)
9. Changes in Matter (Exp. 4, p. 17)

Greenstone, Arthur W., et al. Concepts in Chemistry. New York: Harcourt, Brace and World, Inc., 1966.

10. The Alkanes-Saturated Hydrocarbons (p. 576)
11. Changes in Matter (p. 18)
12. Decomposition by Electrolysis (p. 60)
13. Decomposition by Heat (p. 61)
14. Oxidation-Reduction (p. 284)
15. Oxidation and Electrons (pp.285-6)
16. Hard Water (p. 472)
17. The Formation of Hard Water (p. 473)

IPS Group of Educational Services Incorporated. Introductory Physical Science. New Jersey: Prentice-Hall, Inc., 1967.

18. Decomposition of Sodium Chlorate (Exp. 6.1, p. 101)
19. Decomposition of Water (Exp. 6.2, p. 104)
20. Synthesis of Zinc Chloride (Exp. 6.4, p. 106)
21. A Reaction with Copper (Exp. 6.6, p. 110)
22. Reduction of Copper Oxide (Exp. 6.7, p. 111)

Oxenhorn, Joseph M. and Idelson, Michael N. Pathways in Science, Chemistry 1: The Materials of Nature. New York: Globe Book Company, Inc., 1968.

23. What is Slow Oxidation? (p. 94)

Tracey, George R., et al. Modern Physical Science. New York: Holt, Rinehart and Winston, Inc., 1970.

24. Investigation (p. 264)
25. A Mixture (Inv. p. 18)
26. Soap Making (Inv. p. 141)
27. The Nature of Cleaning (Inv. p. 144)

Brandwein, Paul F., et al. Matter Its Forms and Changes. New York: Harcourt, Brace and World, Inc., 1968.

28. An Apprentice Investigation of a Form of Carbon (p. 477)
29. An Apprentice Investigation of Burning Gas (p. 489)
30. An Apprentice Investigation into Breaking Down Sucrose (p. 493)
31. An Apprentice Investigation into Changes of State (p. 168)
32. An Apprentice Investigation of Substances in an Apple (p. 7)
33. An Apprentice Investigation into Combustion (p. 13)
34. An Apprentice Investigation of Oxygen and Oxidation (p. 14)
35. An Apprentice Investigation of Substances in Natural Water (p. 17)
36. An Apprentice Investigation into the Composition of Water (p. 29)
37. An Apprentice Investigation of Proportion in a Compound (p. 33)
38. An Apprentice Investigation of Electrons (p. 39)
39. An Apprentice Investigation into the Separation of a Metal from an Ore (p. 306)
40. An Apprentice Investigation of a Decomposition Reaction (p. 381)
41. An Apprentice Investigation of the Reaction of Iron with Copper Chloride (p. 383)
42. An Apprentice Investigation of the Reaction of Iron with an Acid (p. 385)
43. An Apprentice Investigation of the Reaction of Chlorine with Potassium Iodide (p. 387)
44. An Apprentice Investigation of a Reaction that Forms a Precipitate (p. 391)
45. An Apprentice Investigation of the Reactions of Substances with Litmus (p. 393)
46. An Apprentice Investigation of the Reaction of an Acid with a Base (p. 395)

Oxenhorn, Joseph M. Pathways in Science, Chemistry 2: Chemistry of Mixtures. New York: Globe Book Company, Inc., 1969.

47. Finding the Right Solvent (p. 22)
48. Demonstration (p. 32)
49. Does the Solute Settle Out of the Solvent (p. 19)
50. How Much Solute Can a Solution Hold (p. 29)
51. Can a Saturated Solution Dissolve More Solute (p. 29)
52. Why Do Suspended Particles Settle (p. 56)
53. What is a Soap (p. 86)

Marcer, John H. and Ledbetter, Elaine W. Teacher's Edition: Physical Science, A Laboratory Approach. Menlo Park: Addison-Wesley Publishing Company, Inc., 1968.

54. The Forms of Water (Exp. 2-1, p. 32)
55. The Forms of Sulfur (Exp. 2-2, p. 33)
56. Building Replicas of Crystals (Exp. 2-3, p. 37)
57. Gases and Heat (Exp. 6-1, p. 127)
58. Testing for Caloric Fluid (Exp. 6-2, p. 129)
59. Testing Volume Change (Exp. 6-3, p. 132)
60. The Mixing of Gases (Exp. 6-4, p. 134)
61. Characteristics of Solutions (Exp. 3-1, p. 53)
62. Other Kinds of Mixtures (Exp. 3-2, p. 55)

Oxenhorn, Joseph M. Pathways in Science, Chemistry 3: Chemistry of Metals. New York: Globe Book Company, Inc., 1970.

63. How Do Metals Combine with Nonmetals? Teacher Demonstration (p. 70)
64. What Other Types of Double Replacements Are There? Try This Experiment (p. 77)
65. Which Metal is More Active: Zinc or Copper? Try This Experiment (p. 80)

Laboratory Activities for Science Students: Junior High School Level. Bulletin 6-G, Miami: Dade County School Board, 1970.

66. Matter Takes Up Space (p. 31)
67. Matter Has Mass (p. 31)
68. Solids (p. 32)
69. Liquids (p. 33)
70. Gases (p. 33)
71. Mixtures (p. 40)
72. A Chemical Change Started by Water: Acetylene (p. 65)
73. Decomposition of Sugar (p. 65)
74. Decomposition With a Catalyst (p. 66)
75. Decomposition by Heat (p. 66)
76. Chemical Equilibrium: Composition of Mercury II (p. 67)
77. Chemical Equilibrium: Decomposition Reaction of Mercuric Oxide (p. 68)
78. Electrolysis of Water (p. 69)
79. Oxidation of Hydrogen Produces Water (p. 70)

FILMS
Available from Dade County Audiovisual Center

1. Carbon and Its Compounds
   AV#1-01968, 10', BW
2. Chemical Changes
   AV#1-10910, 12', C
3. Combustion
   AV#1-10741, 15', C
4. Physical and Chemical Change
   AV#1-30341, 28', BW
5. Simple Changes in Matter
   AV#1-01935, 10', BW
6. Solids, Liquids, and Gases
   AV#1-01739, 10', BW
7. Refrigeration
   AV#1-03551, 10', BW
8. States of Matter
   AV#1-01949, 10', BW

TRANSPARENCIES
Available from Dade County Audiovisual Center

1. Chemistry Laboratory Techniques
   AV#2-00164, BW

REFERENCES

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5. Davis, Ira C., et al. Science 3: Discovery and Progress. New York: Holt, Rinehart and Winston, 1969.

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12. Metcalfe, H. Clark, et al. Modern Chemistry. New York: Holt, Rinehart and Winston, Inc., 1966.

13. Oxenhorn, Joseph M. and Idelson, Michael N. Pathways in Science, Chemistry 1: The Materials of Nature. New York: Globe Book Company, Inc., 1968.

14. Oxenhorn, Joseph M. Pathways in Science, Chemistry 2: Chemistry of Mixtures. New York: Globe Book Company, Inc., 1969.

15. Tracey, George R., et al. Modern Physical Science. New York: Holt, Rinehart and Winston, Inc., 1970.

16. Weisler, Jules J. Review Text in Physical Science. New York: Amsco School Publications, Inc., 1970.

MASTER SHEET--THE WORLD OF MATTER

Objectives	Laboratory Experiments	Student Text (See Reference List)	Supplementary References	Films	Transparencies
1	6,7,11,24,28,29,30	#2. pp. 475-499 #4. pp. 592-597,612 #5. p. 8 #8. pp. 573-576 #15. pp. 258-269 #16. pp. 3-9	#6. p. 558	1	1
2	1,2,3,4,8,31,47, 54,55,56,57,58,59, 60,66,67,68,69,70	#1. pp. 191-206 #2. pp. 166-172 #11. pp. 25-40, 125-141 #14. pp. 23-26 #15. pp. 15-16	#3. pp. 18-20 #6. p. 3 #16. pp. 19-21	9	
3	5,9,11,48	#2. pp. 47-65 #8. pp. 18-20 #14. pp. 4,31-34 #15. pp. 13-15	#3. pp. 16-20 #16. pp. 24-26, 177-180, 204-208	2,4,5,6	
4	25,49,50,51,52, 32,33,34,35,36, 37,38,61,62,71	#2. pp. 30-46, 4-28 #8. pp. 15-18 #11. pp. 53-57 #14. pp. 3,4,7-10, 18,19,27,29,54-60, 64,71-74	#16. pp. 44-49, 62-72		
5	12,13,18,19,20, 21,22,39,40,41, 42,43,44,45,46, 63,72,73,74,75, 76,77,78,79	#2. pp. 304-310 #8. pp. 59,259-262 #9. pp. 101-125	#16. pp. 137-141		
6	14,15,23,26,27, 16,17,24,53	#4. pp. 626,480, 184 #8. pp. 472-476, 263-266,284-289 #12. pp. 515-517 #13. pp. 93-97 #14. pp. 85-91 #15. pp. 122-124, 141-146,363-364,20-23	#3. pp. 133-134, 314-320 #16. p. 193	3,8	